

STATEMENT OF
CAPTAIN TERRY MCVENES,
EXECUTIVE AIR SAFETY CHAIRMAN
AIR LINE PILOTS ASSOCIATION, INTERNATIONAL
BEFORE
THE SUBCOMMITTEE ON AVIATION
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC
MARCH 15, 2005

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ON
LASERS: A HAZARD TO AVIATION SAFETY AND SECURITY
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Good morning. I am Terry McVenes, Executive Air Safety Chairman of the Air Line Pilots Association, International. ALPA is the world's largest pilot union, representing more than 64,000 pilots who fly for 41 airlines in the U.S. and Canada.

We applaud the Committee for holding this hearing and we appreciate the opportunity to provide our views on the hazard posed by the intentional misuse of lasers aimed at our members. The timing of this hearing is virtually coincident with yet another serious laser event – this past Thursday, March 10th, the captain from a major ALPA airline was struck by a green laser as his jet turned to align with the runway for landing at Dallas/Ft. Worth International Airport. He suffered blurred vision in one eye and the First Officer was required to take over the aircraft and land for him. Regardless of whether a prankster or someone with more nefarious intentions was responsible, this event, and others like it, pose a definite danger to airline safety and must be aggressively pursued.

BACKGROUND

Lasers are not a new hazard to aviation and ALPA has been involved with addressing it for more than a decade, when the potential dangers of powerful outdoor displays, such as those used by Las Vegas casinos, first became known. The temporary incapacitation of a B-737 first officer whose aircraft was departing McCarran International Airport in

October of 1995 gave the problem national recognition. In November 1996, the captain of a Skywest Airlines flight sustained an eye injury and was incapacitated when he was irradiated by what was believed to have been a laser beam during approach to the Los Angeles International Airport.

ALPA safety representatives were at the forefront of efforts to address the issue, and did so through promoting amendments of FAA and FDA standards applicable to those types of displays. That specific type of laser hazard, in essence, powerful outdoor laser displays used by legitimate operators, has been satisfactorily addressed and we have not seen evidence of any significant problems in that area since the new standards were adopted.

More recently, however, there has been a proliferation of visible laser beams in airspace created by private users of lasers, which normally are a lower-powered type that are available via the Internet. Twenty laser events occurred between December 23, 2004 and January 2, 2005 alone, and there have been hundreds of these kinds of events over the past several years. Federal authorities filed charges earlier this year against a Parsippany, New Jersey, man for shining a laser at a private plane and temporarily blinding two pilots during their approach to Teterboro Airport. While such lasers are incapable of causing permanent eye damage at long distances, they are certainly able to create a safety hazard, as has been demonstrated repeatedly.

Last September, a laser directed into the flight deck of a B-737 as it made an approach into Salt Lake City International Airport burned the retina of the First Officer. No public law enforcement report has been made on the source of the laser or its power output, but it is surmised to have been a high-powered laser.

PHYSIOLOGICAL EFFECTS OF LASERS

The word “laser” is actually an acronym that stands for “light amplification by stimulated emission of radiation.” Laser light differs from common sources of electrically generated light in three ways: it is monochromatic, directional, and coherent (i.e., has a continuous wave form). Laser lights are low-powered compared to ordinary light, but they can be dangerous to the human eye because they focus their energy in a very small area.

A laser illumination event can result in temporary vision loss associated with (1) flash-blindness (a visual interference that persists after the source of illumination has been removed), (2) after-image (a transient image left in the visual field after exposure to a bright light), and (3) glare (obscuration of an object in a person’s field of vision due to a bright light source located near the same line of sight). Laser effects on pilots occur in four stages of increasing seriousness – distraction, disruption, disorientation, and incapacitation. Given the hundreds of incidents of cockpit illuminations by lasers, the potential for an accident definitely exists, but a professional two-pilot crew certainly helps safeguard against that possibility.

Clearly, flight operations nearest the ground and especially during approach and landing, are of the greatest concern. A June 2004 report by the FAA's Office of Aerospace Medicine was published on "The Effects of Laser Illumination on Operational and Visual Performance of Pilots During Final Approach." Thirty-four pilots served as test subjects to determine the effects of laser light on their ability to fly safely during final approach maneuvers in what the FAA has defined as the "Laser-Free Zone" or LFZ. Pilot performance was measured using subjects in a 727-200 simulator who were exposed to four eye-safe levels of green laser light. A few excerpts from that study are noteworthy:

"To ensure optimal visual performance at night when viewing objects inside and outside the cockpit, a pilot's eyes should be adapted for mesopic vision [i.e., night vision]... if the eyes are briefly exposed to a source of intensely bright light, such as from a laser, while in a mesopic state of adaptation, temporary visual impairment will almost certainly occur. Visual effects can last for several seconds to several minutes.

At the lowest exposure level ($0.5\mu\text{W}/\text{cm}^2$)¹, 67% of the responses indicated that test subjects experienced adverse visual effects from laser exposure. Higher exposure levels resulted in significantly greater performance difficulties and a total of nine aborted landings."

Currently, there are no practical and reliable technologies available to guard airline pilots from the effects of lasers. Protective eyewear (aka "notch filters") can provide excellent protection from specific wavelengths, but they limit the pilot's ability to read instruments, they must be carefully adjusted, and they have other shortcomings. Unfortunately, there are as yet no practical and effective windscreen filters that would serve the same purpose. Research is ongoing to develop filters that could be used for airline operations and ALPA is supportive of continuing this research.

FAA RESPONSE AND POLICY

On January 11, 2005, the Federal Aviation Administration (FAA) issued Advisory Circular (AC) No. 70-2, "Reporting of Laser Illumination of Aircraft." The purpose of the AC is to provide "information to the aviation community operating within the National Airspace System (NAS) regarding steps taken by the FAA to address the unauthorized illumination of aircraft by lasers." The AC became effective on January 19, 2005, and requires all pilots to immediately report any laser sightings to air traffic controllers. It also requires controllers to share that information through the federal Domestic Events Network (DEN). As reflected in the AC, the DEN supports the sharing of real-time, security-related information affecting National Air Space air traffic

¹The output of green lasers currently sold for use as outdoor pointers is approximately 10 times more powerful (i.e., $5\mu\text{W}/\text{cm}^2$) than that of the lowest illumination used with the test subjects.

operations among the FAA, TSA, and other governmental stakeholders, including law enforcement agencies.

As related in the AC, the ATC report includes event date and time, operator, flight number, type of aircraft, nearest major city, altitude, location of the event, a brief description of the event, and any other information needed to support the action.

On January 12, 2005, Transportation Secretary Norman Mineta reported that there is “no specific or credible intelligence that would indicate that these laser incidents [which occurred around the holidays] are connected to terrorists.” Additional law enforcement and intelligence community sources have confirmed to ALPA that the recent spate of laser incidents cannot be linked to terrorism. Based on these facts, it seems likely that the incidents are being conducted by individual lawbreakers, rather than by terrorists, or in the words of Secretary Mineta, “careless people making stupid choices to put pilots and their passengers at risk.”

NORAD LASER WARNING SYSTEM

Reports were made last month of a laser warning system being researched by the North American Aerospace Defense Command (NORAD). The system would use alternating red and green eye-safe lasers to warn pilots of their entrance into restricted airspace, specifically, that which protects the Capitol and White House, when they cannot be reached by radio. ALPA is familiar with the system and we have concerns with it, not the least of which is the concept of using a device that could startle, distract or disrupt pilots and lessen safety as a result.

It is our understanding that the Defense Department and FAA are still reviewing this proposal. We recommend that those organizations include all affected airspace users in their deliberations to help preclude the development of a system that would create a safety hazard.

RECOMMENDATIONS

- ALPA recommends that law enforcement agencies continue to take the laser hazard very seriously and fully investigate and bring to justice those who intentionally illuminate cockpits with lasers. We urge prosecutors and the courts to impose maximum penalties in these cases to deter others who might think that use of lasers against aircraft constitutes a harmless prank.
- ALPA calls on the federal government to improve information flow, both for reporting incidents or suspicious activity of any kind, to a central office for analysis, and for dissemination of security information to pilots. The procedures for reporting laser incidents and broadcasting this information to pilots in the cockpit are an important first step toward that goal.

- Although the federal government has publicly said that it knows of no specific, credible evidence that terrorists may be involved in these laser incidents, we must not assume that will always be true. We would urge DHS and other appropriate agencies to continue monitoring for any indications of terrorist connections to such activity. ALPA continues to evaluate this growing threat to aviation, and continues to collect as much information about it as possible.
- Work is underway to develop human factors-based safety enhancements to help pilots cope in the event of unauthorized laser illumination events in navigable airspace. Included in this effort are the creation of operational procedures, simulator training, ground school educational materials for commercial aviation, general aviation and information for the general population. The government and industry should support these efforts.
- Government and industry should also support and accelerate research and development of notch filter technology that can protect airline crews from the potential risk of lasers.

Mr. Chairman, thank you once again for permitting us to testify today. I would be pleased to respond to any questions that you may have.

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